

WORKING IN ORBIT

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LAUGHTER AND TEARS

The behaviour of astronauts during extended missions has provided a preview of psychological problems that space workers are likely to encounter.

Surprisingly, one problem is exuberance. On the first Soviet Salyut mission, which lasted 96 days, one crew member put his head outside to have a look around and almost drifted away, endangering the mission.

More often, astronauts feel lonely and isolated. "One is always sharply aware that one is not on earth during a flight, that one is separate," reports the veteran Soviet cosmonaut Vitaly Sevastyanov. The Russians sought to make the cosmonauts feel closer to home by setting up a television system that allowed them to see

their families as they talked to them from space. But it only exacerbated the problem. "Tears flowed when we heard the voices," recalls Sevastyanov.

Work seems to be a good antidote for depression. The Russians gave their cosmonauts a psychological boost by soliciting their suggestions for improving the science experiments they performed on board. The cosmonauts particularly enjoyed an experiment called OAZIS, in which they had to grow peas, green onions and other plants; they even spent their free time tending the seedlings.

On short-term flights, astronauts don't seem to mind working long hours, but unceasing work takes its toll during a long mission. On Skylab 4, astronauts Kerr, Pogue and Gibson worked 16 hours a day for six weeks without a day off. Since the voyage was to be the last of its kind for a long time, scientists scheduled and rescheduled experiments at a frantic pace.

Apparently, the best way to antagonise an astronaut is to change his schedule without his consent. The crew finally protested by going on strike for a day midway through the 12-week mission. Kerr and Pogue spent the day looking out of the window at the view of earth, and Gibson tinkered with the solar telescope.

Long space flights, can also lead to moodiness and hostility among crew members. An unanticipated problem caused by living in zero gravity was that fluids accumulated in the astronauts' faces and altered their expressions. This subtle change affected the nonverbal communication among the astronauts.

Finding privacy in the cramped quarters of a spacecraft is often a problem too. The desire for solitude became so important to the Soviet Salyut-6 cosmonauts during a 175-day trip that they asked for a privacy curtain to be sent up from earth.

— Alcestis Oberg and Laura Danly

American orbital activities for decades to come. The space shuttle will drop off equipment and materials needed for large-scale construction activities, and other spacecraft will use it as a way station to geosynchronous orbit and to the solar system beyond. Astronauts manning this frontier outpost will live in Spartan four-man modules the size of a one-bedroom apartment.

NASA engineers have plenty of projects to keep the astro-workers busy. One will be enormous antennas that would dwarf even the 100-metre dishes deployed in the 1980s. Another will be Lunetta, a mirror up to a kilometre in diameter that can reflect sunlight to earth. It could illuminate city streets at night and permit around-the-clock rescue work in disaster areas. The most spectacular of all, though, will be a fleet of solar-power satellites. The construction of each satellite, 64 square kilometres of solar panels, will require about 600 workers and 50,000 tonnes of materials. To fire all that weight into space would be very costly — a problem that may lead to use of the moon for raw materials instead, since less power is needed to escape the moon's weaker gravitational field. Even so, the project has snagged for now on its high cost and on possible environmental problems in beaming the solar energy to earth.

Space planners are puzzling over the best way to build structures in orbit. The construction of platforms will offer plenty of work for hard hats. The shuttle will fly all the parts to an orbital site where astronauts, like youngsters playing with a

construction set, will bolt them together. To build even larger structures, Grumman has developed a machine that will manufacture the trusses in space. The "Beam builder" swallows rolls of unformed metal and will spew trussed beams out of the other end at a rate of about 1.6 kilometres a day.

Some of the tools NASA is designing have a touch of *Star Wars* about them. The manned-manoeuvring unit is a hefty backpack with jet thrusters. Astronauts will use it to fly around a construction site — taking care, though, to remain in the same orbit as their operations centre. If they work above or below the centre, they will have a slightly different altitude and orbit and will slowly drift away. Returning

Astronauts will move around in space with jet thrusters in a backpack. They must stay in orbit or they will drift slowly away. Returning to base might be difficult.

to the base might be difficult. Because of the complexities of orbital mechanics, firing the rockets in a beeline sprint for home would probably widen the distance rather than close it.

Astronauts will also work from cherry pickers attached to the shuttle's manipulator arm. Anchored by foot restraints, they will have their arms free to weld joints or replace failed modules. Some of the cherry pickers will have enclosed cabins and mechanical arms, allowing people to work in shirtsleeves. There will be small free-flying craft, also with mechanical arms, that will buzz around the site like bees around a trellis of roses. Robots and other machines will perform many of the repetitive tasks.

This Buck Rogers scenario is tantalisingly close to becoming a reality, but engineers are moving cautiously because of their lack of extensive experience in weightlessness. With few ways to test zero-gravity building methods on the ground, they are forced to make many assumptions. Jerry Hanley, a program manager for large-satellite systems, likens it to a zero-gravity civilisation thinking about building a bridge across Sydney Harbour. "If you were used to living and working and building things in space, you would say it was difficult to build the bridge because of the pull of gravity," he says. "And you would be worrying about the wind and all the water and spray." Those alien people might build the bridge, but it would be a ponderous structure that would inspire no postcards or poems.



A R T

THE REMARKABLE VISION OF **RON COBB**

The man whose unique imagination created the special effects of "Alien" and the extraterrestrials of "Star Wars" has just spent more than a year of his life working on an ambitious new project. Here we report on the man and his amazing images.



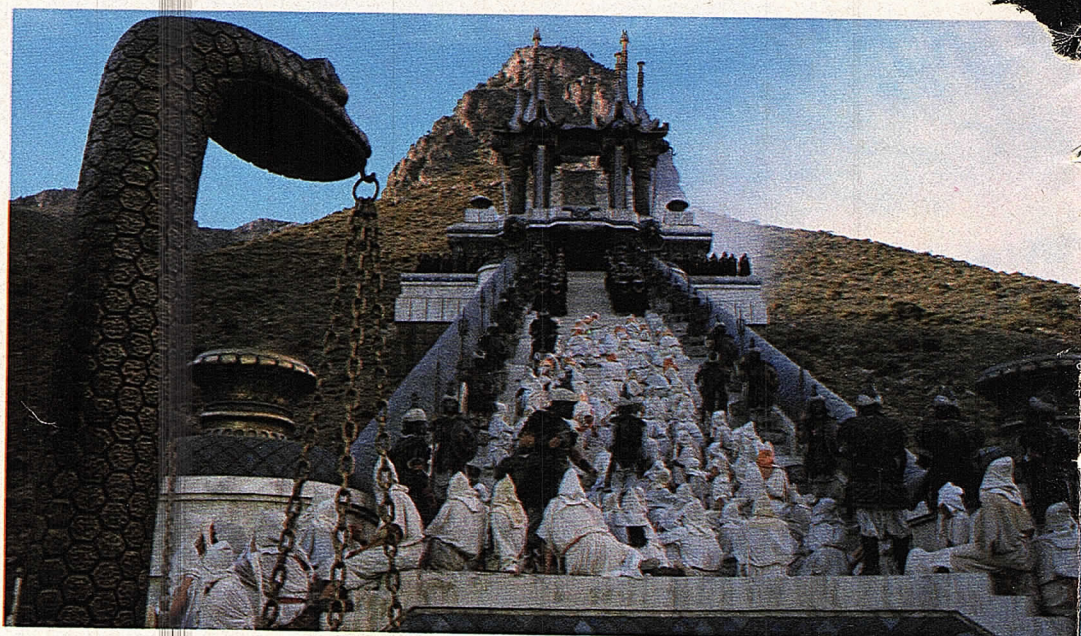
There is no one like Ron Cobb. His talent and the rich imaginings from which it springs are unique. His philosophy of living in a technological world is refreshing. His success in the field of fantasy design is legendary.

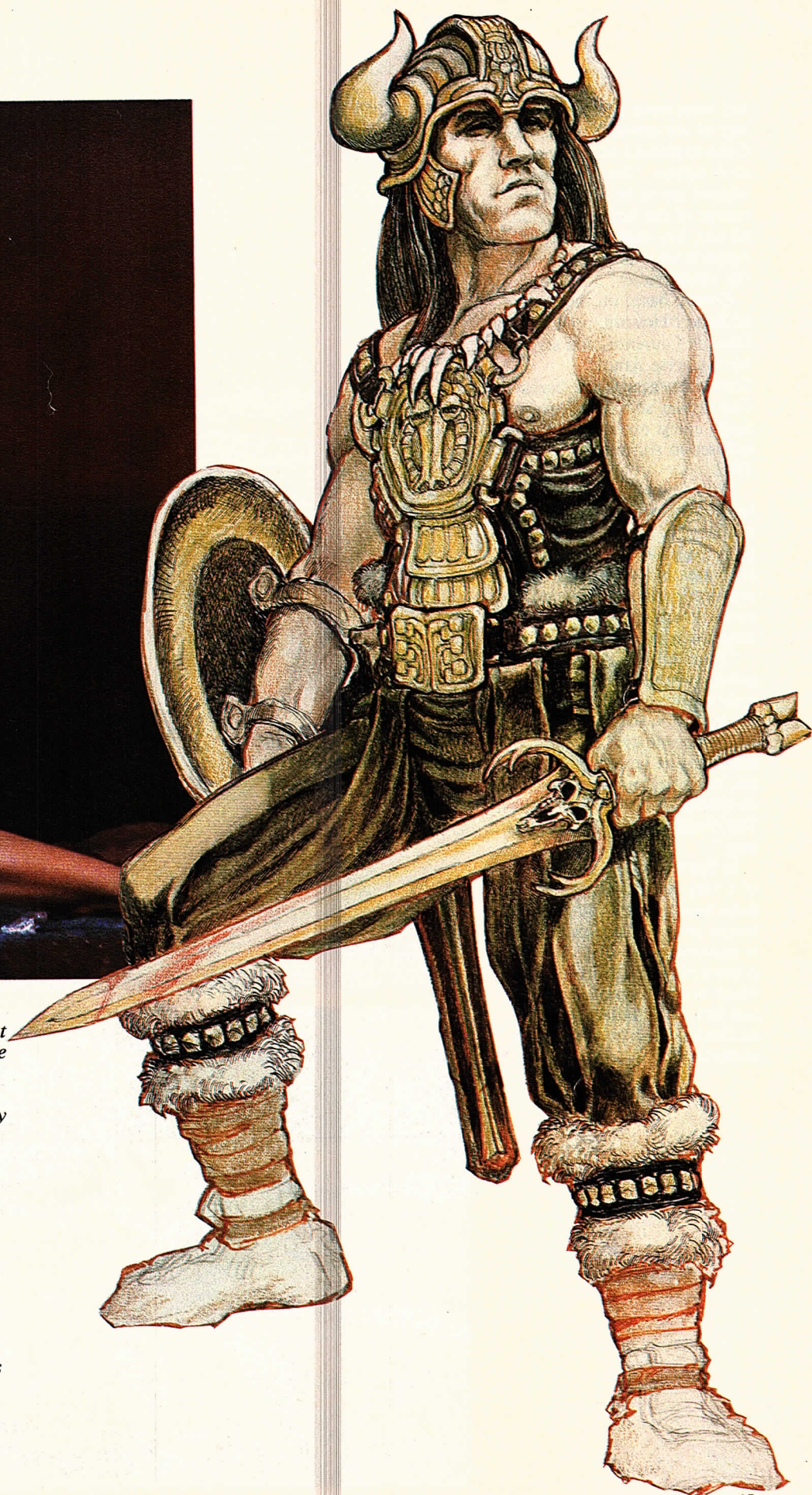
Most striking of all, this 41-year-old American, famous for his work on *Star Wars* and *Alien*, is delightfully resistant to classification. He is at the same time socially committed but politically unaligned; a fantasist but a painstaking technician; an unwordly freewheeler but a commercial hit. Million-dollar movie-makers dance to *his* tune. "I like to keep the thought processes moving," he says simply.

Others describe his influence more forcefully. "The first time I saw Cobb's work was in 1964," says screenwriter and film director John Milius. "Ten years later . . . those paintings still obsessed me. I thought of them, dreamed of them. I began to believe that I had never really seen them — only imagined them."

Something of this hypnotic force of Cobb's work is captured in *Ron Cobb: Colorvision*, a new illustrated book published in Australia by Wild & Woolley. It traces his career through his art, from early fantasy work, through a period of biting social cartoons, culminating in his latest major film project, the fantasy epic *Conan*.

"My involvement with *Conan*





RIGHT: Conan the Barbarian. The design of key costumes was an important part of Ron Cobb's overall control of the look of the film. He revelled in the chance to "create an ancient world".

ABOVE: The role of Conan is played by Mr Universe Arnold Schwarzenegger in his first-ever performance in a major film. To Cobb, the technical mastery of effects must always take second place to the emotional impact.

LEFT: This magnificent ceremonial temple and steps was constructed from Cobb's designs on location in Spain. "I hated to have mistakes in the sets," says Cobb. "If there was even a minor one, I'd have to work out if I'd have to tear the whole thing down. Cost was a consideration. It was traumatic."

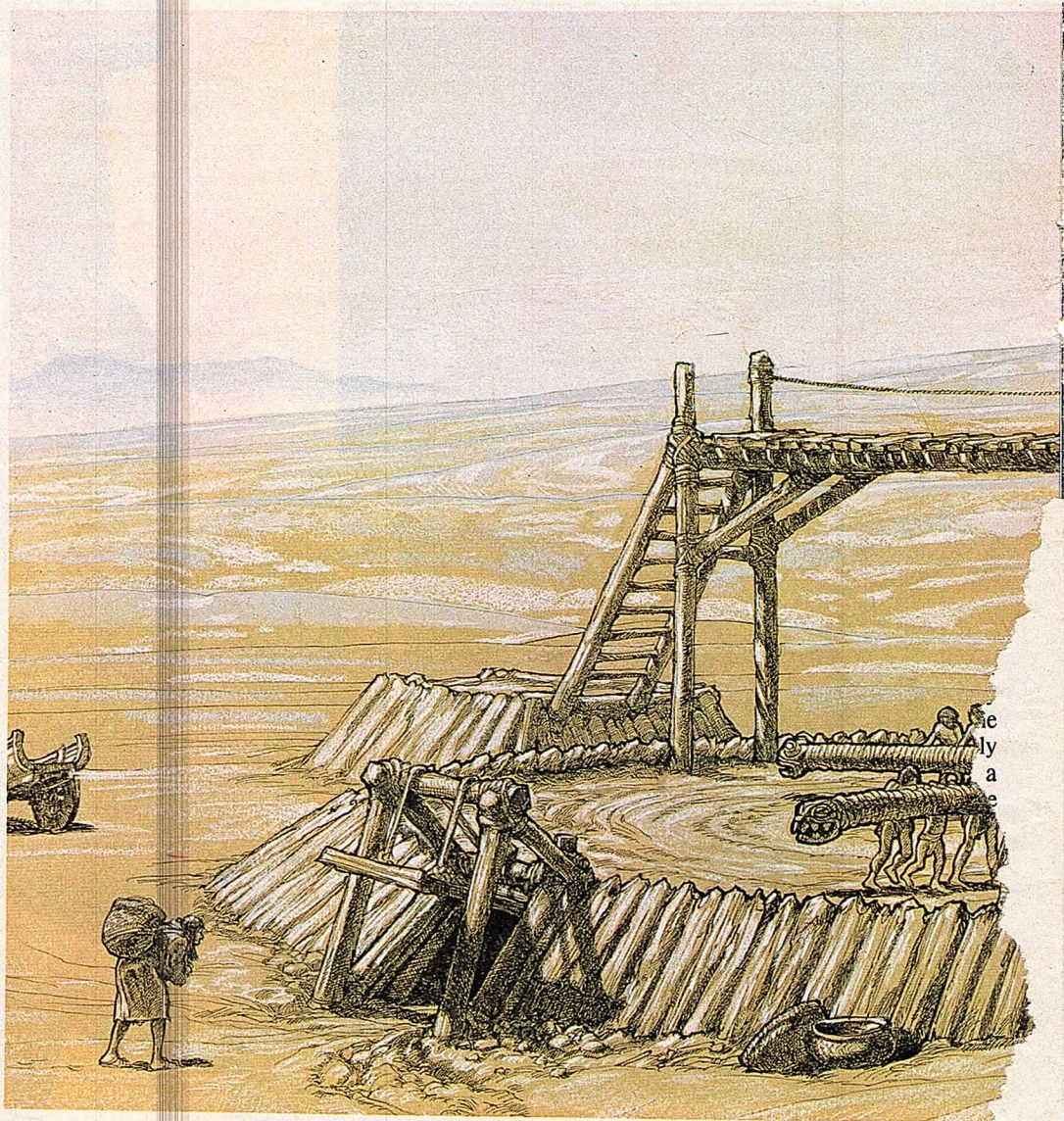
has been more extended than any of my previous work," Ron Cobb explained on a recent visit to Australia. "John Milius wanted me to be totally in charge of the look of the film: all sets, key costumes, the illusions we wanted to create, the model shots."

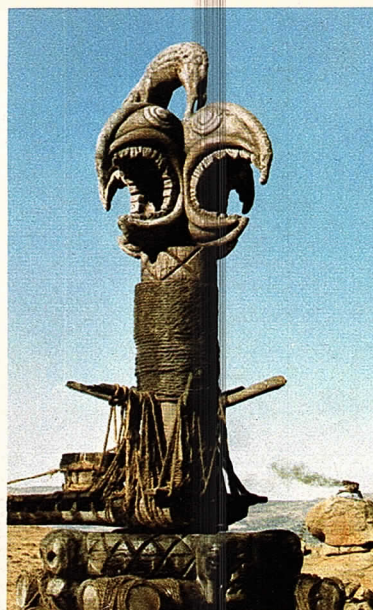
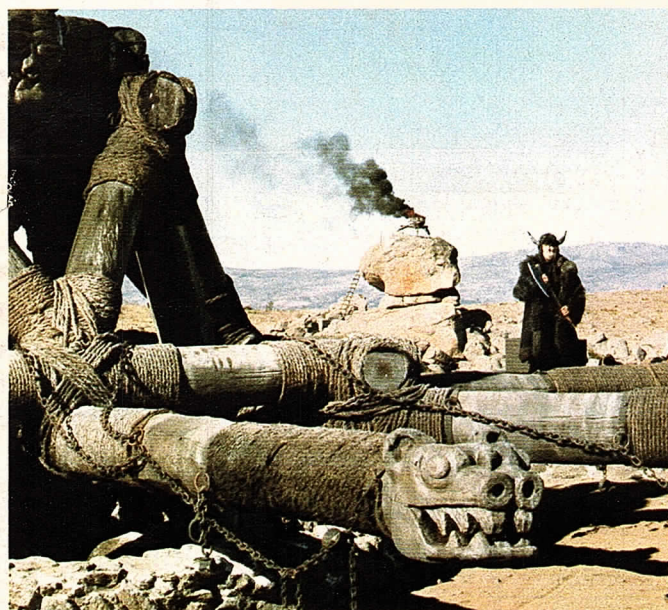
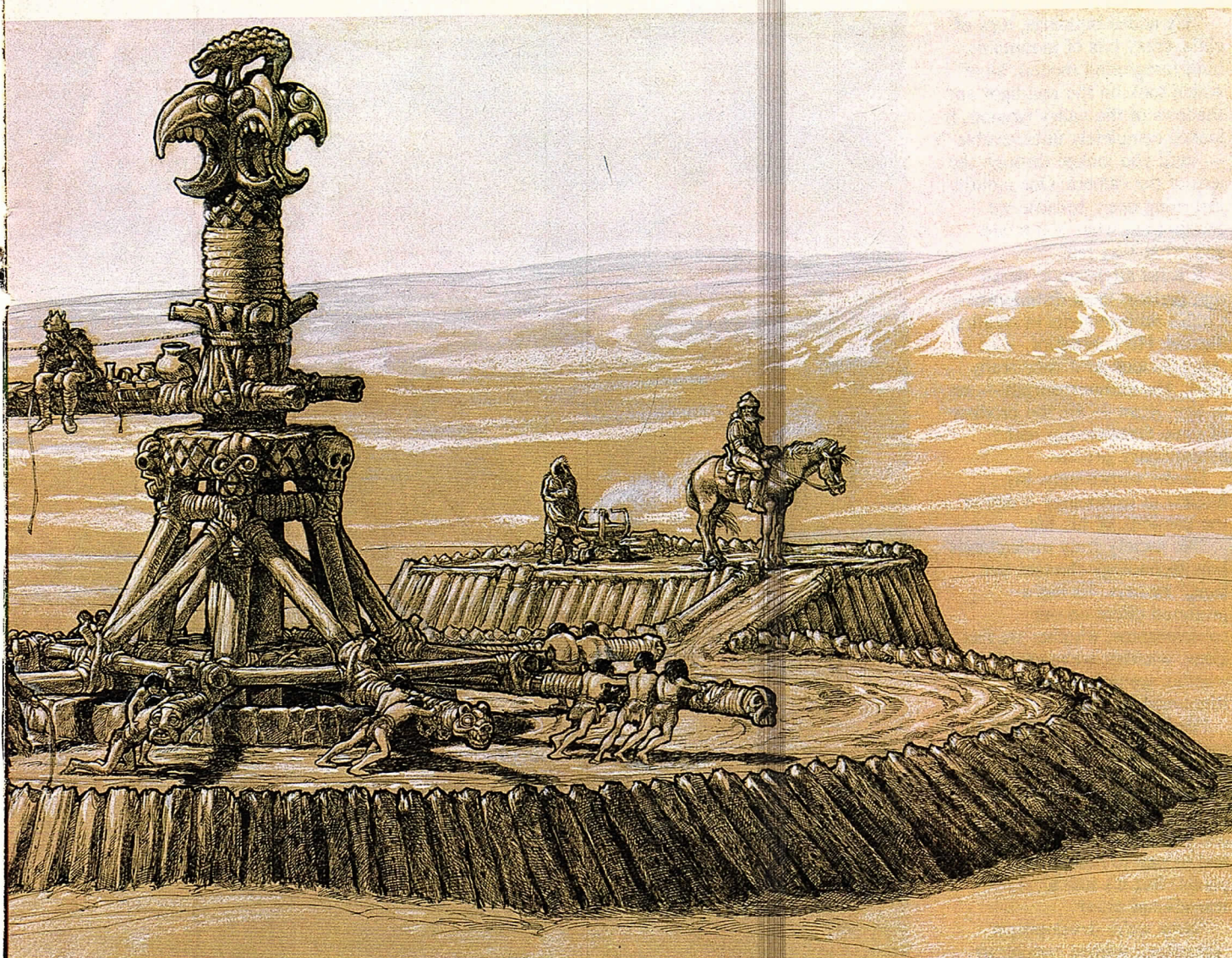
Conan, based on the writing of Robert Howard, produced by Dino de Laurentiis and starring Mr Universe Arnold Schwarzenegger as the barbarian Conan, was shot on location in Spain and is expected to be released in Australia early in 1982.

For Cobb, whose rich imagination revelled in the challenge of "having to invent an ancient world", there was an even greater spur in solving the practical problems of design, set construction and total suspension of disbelief.

"There is always a way of getting something on to the screen, but you must design the method. You may want to design an immense city, stretching as far as the eye can see, but to achieve it you have to choose a painting or a model. The challenge is to find the way."

In Spain, Cobb was reminded of a very old technique that dates back to silent films. It hinges on a model-maker's skill in painting on tin and constructing cantilevered images which are incorporated into the real film set in order to create an illusion from one particular viewpoint.





ABOVE: Cobb's acrylic design for "The Wheel of Pain" in "Conan". LEFT: The reality of the Wheel as it came to life during the filming. Cobb devised his own method of set design as he began work on the movie. "I liked to work on full-scale drawings of plan and elevation — a rendered plan with shadows and colour, but very precise. Most important of all, I'd work out the rhythms of space, the proportions, the repetitions. For the first time in my life I was drawing things that could actually be built. Was I correct in my assumptions about what constitutes efficiency, load-bearing configurations and so on? To my amazement, it worked."

"We added buildings, tops of cliffs, crazy bits of mountains, built foreground models, all of which took on the real light and shadows of the valley beyond. It looked completely unbelievable — until you looked through the lens of the camera. Our mouths just hung open, because we couldn't tell what was model and what was real."

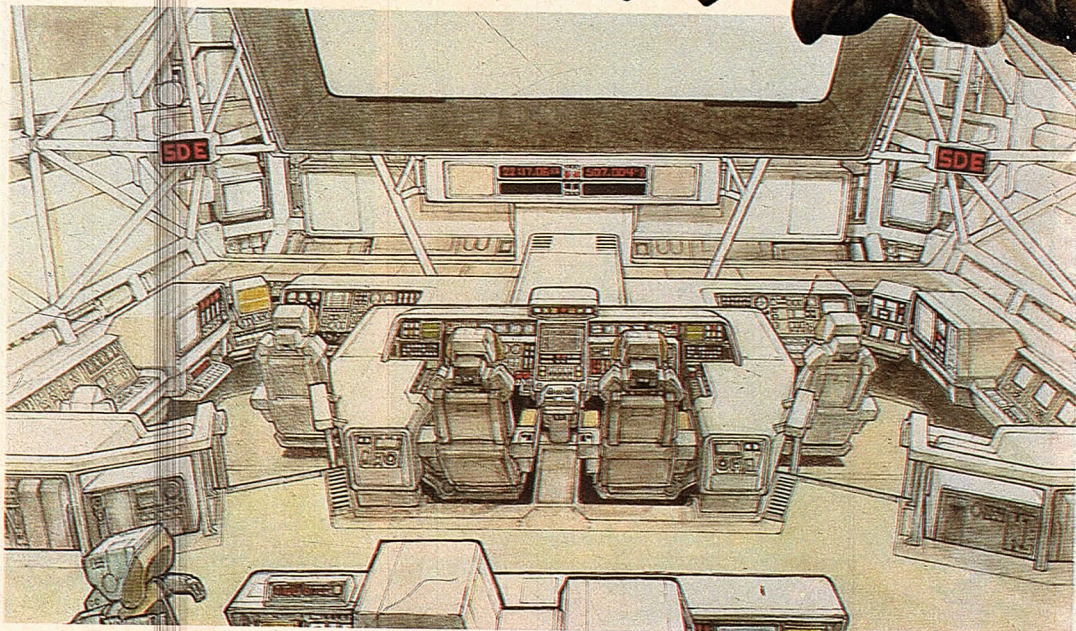
It is his attention to detail that perhaps most distinguishes Cobb's achievements in creating illusion. His spaceships — as in *Alien* — look as if they really work. His extraterrestrials — as in *Star Wars* — are the product of some fantastic but *real* evolutionary process.

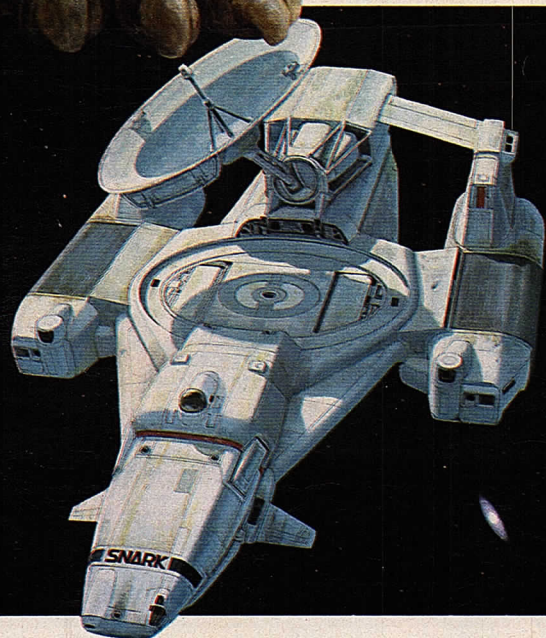
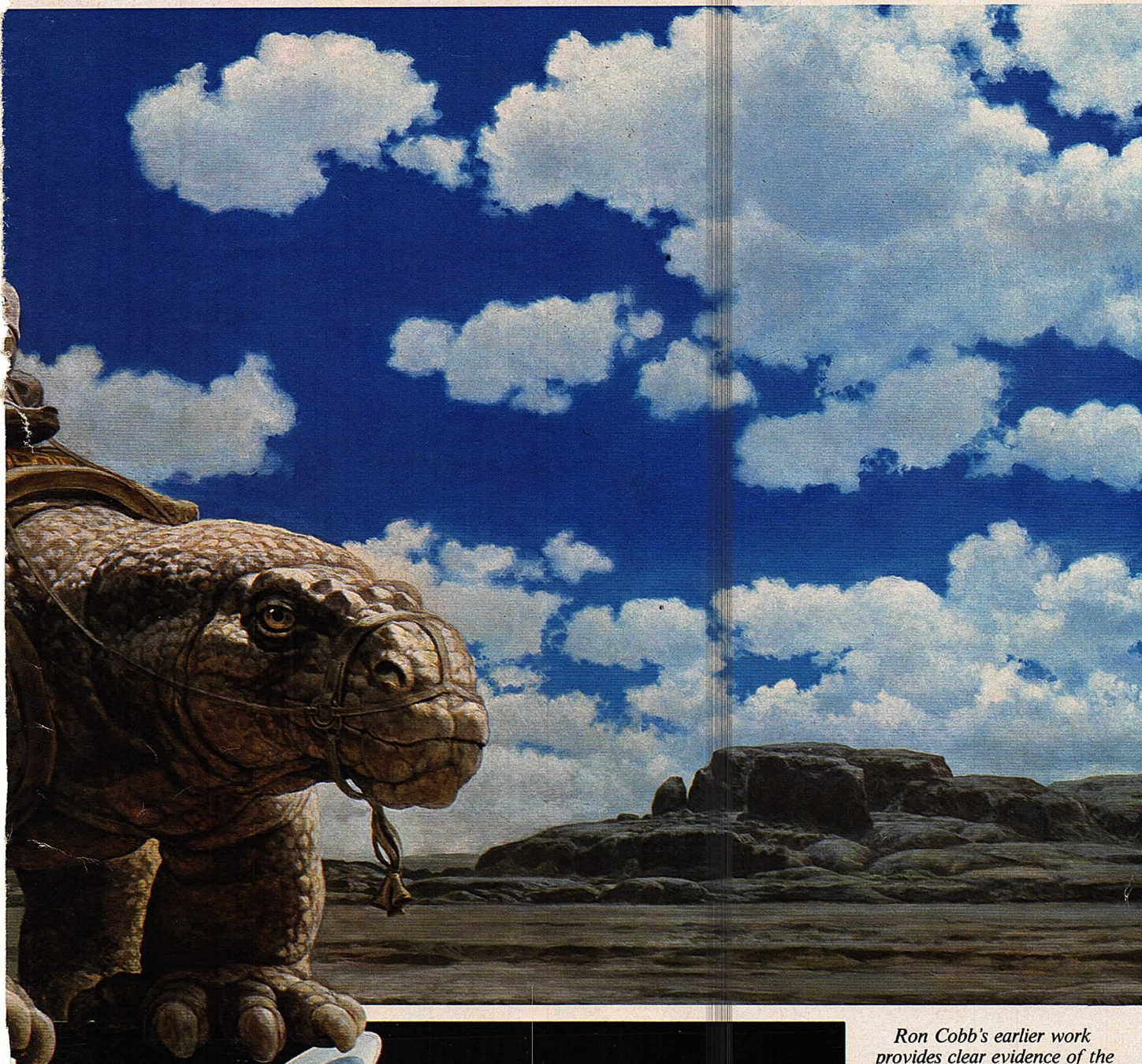
Hardly surprisingly, his interest in technology is one of the passions of his life.

"No society truly understands how technology changes our lives," he says. "It has a profound effect on our consciousness, whether we feel alone, whether we're greedy, whether we're insecure or frightened or not."

"Human beings have had to rely on tool-use to survive. We've come to rely heavily on our cleverness, we're intoxicated by it. If this has got out of control, that's the price we've had to pay to remain on this planet. But it's just a transitional phase."

"Now we're developing a technology refined enough to allow us to become human again. We've passed the crisis, if we don't blow ourselves up. The next job is to scramble on top."





Ron Cobb's earlier work provides clear evidence of the unique nature of his talent. ABOVE: This piece of realistic fantasy is titled "Man on Lizard Crossing Over." FAR LEFT: "Alien" was the film that gave Cobb his first major opportunity in film-designing. This version of the earthship control bridge has a large video screen displaying data from outside. LEFT: "Earthship Snark" was an early name for the "Nostromo" in the film "Alien". A notable feature of all Cobb's designs is that his machines, however fantastic, look as if they would work.

